

Virginia Department of Environmental Quality

VURAM

Virginia Unified Risk Assessment Model

VERSION: 1.11

Residential Calculated Hazard/Risk Report Total Hazard/Risk for All Media

Non-Cancer Adult	Non-Cancer Child	Cancer
Total: 9.31E+01	Total: 1.01E+02	Total: 1.72E-03
<i>Hazard Exceeded!</i>	<i>Hazard Exceeded!</i>	<i>Risk Exceeded!</i>

All Report Pages are Required for Risk Assessment Submission

DETAILED REPORT FOLLOWS

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

Soil

Analyte: Benzene

CAS: 71-43-2

Concentration:	1.00E+02	mg/kg		Calculated Hazard/Risk Values			
RfDo:	4.00E-03	Non-Cancer Adult		Non-Cancer Child		Cancer	
RfCi:	3.00E-02	Ingestion:	3.00E-02	Ingestion:	3.20E-01	Ingestion:	7.91E-06
SFO:	5.50E-02	Dermal:		Dermal:		Dermal:	
IUR:	7.80E-06	Inhalation:	9.03E-01	Inhalation:	9.03E-01	Inhalation:	7.85E-05
Mutagen:		Total:	9.33E-01	Total:	1.22E+00	Total:	8.64E-05
% Contribution to Media Hazard/Risk			4.07%	4.72%		16.46%	

Hazard Exceeded Risk Exceeded!	mg/kg	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		N/A	8.18E+01	1.16E+01

Analyte: Chromium(VI)

CAS: 18540-29-9

Concentration:	1.00E+02	mg/kg		Calculated Hazard/Risk Values			
RfDo:	3.00E-03	Non-Cancer Adult		Non-Cancer Child		Cancer	
RfCi:	1.00E-04	Ingestion:	4.00E-02	Ingestion:	4.26E-01	Ingestion:	3.26E-04
SFO:	5.00E-01	Dermal:		Dermal:		Dermal:	
IUR:	8.40E-02	Inhalation:	7.05E-04	Inhalation:	7.05E-04	Inhalation:	6.09E-06
Mutagen:	Y	Total:	4.07E-02	Total:	4.27E-01	Total:	3.33E-04
% Contribution to Media Hazard/Risk			0.18%	1.65%		63.35%	

Risk Exceeded!	mg/kg	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		N/A	N/A	3.01E+00

Analyte: Trichloroethylene

CAS: 79-01-6

Concentration:	1.00E+02	mg/kg		Calculated Hazard/Risk Values			
RfDo:	5.00E-04	Non-Cancer Adult		Non-Cancer Child		Cancer	
RfCi:	2.00E-03	Ingestion:	2.40E-01	Ingestion:	2.56E+00	Ingestion:	1.14E-05
SFO:	4.60E-02	Dermal:		Dermal:		Dermal:	
IUR:	4.10E-06	Inhalation:	2.17E+01	Inhalation:	2.17E+01	Inhalation:	9.46E-05
Mutagen:	Y	Total:	2.19E+01	Total:	2.43E+01	Total:	1.06E-04
% Contribution to Media Hazard/Risk			95.75%	93.63%		20.19%	

Hazard Exceeded Risk Exceeded!	mg/kg	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		4.56E+00	4.12E+00	9.44E+00

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Each Chemical	Default Risk for All Chemicals
1.00E+00	1.00E-05	1.00E-04

Soil

Total Calculated Hazard/Risk For Media: Soil

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	3.10E-01	Ingestion:	3.30E+00	Ingestion:	3.46E-04
Dermal:	0.00E+00	Dermal:	0.00E+00	Dermal:	0.00E+00
Inhalation:	2.26E+01	Inhalation:	2.26E+01	Inhalation:	1.79E-04
Total:	2.29E+01	Total:	2.59E+01	Total:	5.25E-04

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

Groundwater

Analyte: Benzene

CAS: 71-43-2

Concentration:	1.00E+02	ug/L	Calculated Hazard/Risk Values		
			Non-Cancer Adult	Non-Cancer Child	Cancer
RfDo:	4.00E-03				
RfCi:	3.00E-02				
SFO:	5.50E-02				
IUR:	7.80E-06				
Mutagen:					
Ingestion:			7.49E-01	1.25E+00	7.06E-05
Dermal:			1.12E-01	1.65E-01	1.02E-05
Inhalation:			1.60E+00	1.60E+00	1.39E-04
Total:			2.46E+00	3.01E+00	2.20E-04
% Contribution to Media Hazard/Risk			4.96%	5.49%	21.38%

Hazard Exceeded Risk Exceeded!	ug/L	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		4.07E+01	3.32E+01	4.55E+00

Analyte: Naphthalene

CAS: 91-20-3

Concentration:	1.00E+02	ug/L	Calculated Hazard/Risk Values		
			Non-Cancer Adult	Non-Cancer Child	Cancer
RfDo:	2.00E-02				
RfCi:	3.00E-03				
SFO:					
IUR:	3.40E-05				
Mutagen:					
Ingestion:			1.50E-01	2.49E-01	
Dermal:			9.47E-02	1.43E-01	
Inhalation:			1.60E+01	1.60E+01	6.05E-04
Total:			1.62E+01	1.64E+01	6.05E-04
% Contribution to Media Hazard/Risk			32.70%	29.89%	58.92%

Hazard Exceeded Risk Exceeded!	ug/L	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		6.16E+00	6.11E+00	1.65E+00

Analyte: Trichloroethylene

CAS: 79-01-6

Concentration:	1.00E+02	ug/L	Calculated Hazard/Risk Values		
			Non-Cancer Adult	Non-Cancer Child	Cancer
RfDo:	5.00E-04				
RfCi:	2.00E-03				
SFO:	4.60E-02				
IUR:	4.10E-06				
Mutagen:	Y				
Ingestion:			5.99E+00	9.97E+00	8.46E-05
Dermal:			9.63E-01	1.45E+00	1.34E-05
Inhalation:			2.40E+01	2.40E+01	1.05E-04
Total:			3.09E+01	3.54E+01	2.03E-04
% Contribution to Media Hazard/Risk			62.34%	64.62%	19.71%

Hazard Exceeded Risk Exceeded!	ug/L	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		3.23E+00	2.83E+00	4.94E+00

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

Groundwater

Total Calculated Hazard/Risk For Media: Groundwater

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	6.89E+00	Ingestion:	1.15E+01	Ingestion:	1.55E-04
Dermal:	1.17E+00	Dermal:	1.76E+00	Dermal:	2.36E-05
Inhalation:	4.16E+01	Inhalation:	4.16E+01	Inhalation:	8.49E-04
Total:	4.96E+01	Total:	5.48E+01	Total:	1.03E-03

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

Air

Analyte: Benzene

CAS: 71-43-2

Concentration:	2.27E+01	ug/m3	Calculated Hazard/Risk Values			
RfDo:			Non-Cancer Adult	Non-Cancer Child	Cancer	
RfCi:	3.00E-02		Ingestion:	Ingestion:	Ingestion:	
SFO:			Dermal:	Dermal:	Dermal:	
IUR:	7.80E-06		Inhalation:	7.26E-01	Inhalation:	6.31E-05
Mutagen:			Total:	7.26E-01	Total:	6.31E-05
% Contribution to Media Hazard/Risk			3.52%	3.52%	37.29%	

Risk Exceeded!	ug/m3	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		N/A	N/A	3.60E+00

Analyte: Naphthalene

CAS: 91-20-3

Concentration:	1.80E+00	ug/m3	Calculated Hazard/Risk Values			
RfDo:			Non-Cancer Adult	Non-Cancer Child	Cancer	
RfCi:	3.00E-03		Ingestion:	Ingestion:	Ingestion:	
SFO:			Dermal:	Dermal:	Dermal:	
IUR:	3.40E-05		Inhalation:	5.75E-01	Inhalation:	2.18E-05
Mutagen:			Total:	5.75E-01	Total:	2.18E-05
% Contribution to Media Hazard/Risk			2.79%	2.79%	12.89%	

Risk Exceeded!	ug/m3	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		N/A	N/A	8.26E-01

Analyte: Trichloroethylene

CAS: 79-01-6

Concentration:	4.03E+01	ug/m3	Calculated Hazard/Risk Values			
RfDo:			Non-Cancer Adult	Non-Cancer Child	Cancer	
RfCi:	2.00E-03		Ingestion:	Ingestion:	Ingestion:	
SFO:			Dermal:	Dermal:	Dermal:	
IUR:	4.10E-06		Inhalation:	1.93E+01	Inhalation:	8.43E-05
Mutagen:	Y		Total:	1.93E+01	Total:	8.43E-05
% Contribution to Media Hazard/Risk			93.69%	93.69%	49.82%	

Hazard Exceeded Risk Exceeded!	ug/m3	Non-Cancer Adult	Non-Cancer Child	Cancer
Recommended Acceptable Concentration		2.09E+00	2.09E+00	4.78E+00

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Each Chemical	Default Risk for All Chemicals
1.00E+00	1.00E-05	1.00E-04

Air

Total Calculated Hazard/Risk For Media: Air

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	0.00E+00	Ingestion:	0.00E+00	Ingestion:	0.00E+00
Dermal:	0.00E+00	Dermal:	0.00E+00	Dermal:	0.00E+00
Inhalation:	2.06E+01	Inhalation:	2.06E+01	Inhalation:	1.69E-04
Total:	2.06E+01	Total:	2.06E+01	Total:	1.69E-04

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

Total Hazard/Risk for All Media

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	7.20E+00	Ingestion::	1.48E+01	Ingestion::	5.01E-04
Dermal:	1.17E+00	Dermal:	1.76E+00	Dermal:	2.36E-05
Inhalation:	8.48E+01	Inhalation:	8.48E+01	Inhalation:	1.20E-03
Total:	9.31E+01	Total:	1.01E+02	Total:	1.72E-03
<i>Hazard Exceeded!</i>		<i>Hazard Exceeded!</i>		<i>Risk Exceeded!</i>	

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

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Exposure Defaults Follow

Program: Voluntary Remediation Program (VRP)

Risk Based Performance Criteria

Default Hazard Index
1.00E+00

Default Risk for Each Chemical
1.00E-05

Default Risk for All Chemicals
1.00E-04

Residential Exposure Default Values

Description	Value
Residential Soil Adherence Factor - adult (mg/cm2)	0.07
Residential Soil adherence Factor - child (mg/cm2)	0.2
Residential Averaging Time (days/yr)	365
Residential Body Weight - adult (kg)	80
Residential Body Weight - child (kg)	15
Residential Soil Mutagenic Dermal Contact Factor - age adjusted (mg/kg)	428260
Residential Soil Dermal Contact Factor - age adjusted (mg/kg)	103390
Residential Groundwater Mutagenic Dermal Contact Factor - age adjusted (cm2-event/kg)	8191633
Residential Groundwater Dermal Contact Factor - age adjusted (cm2-event/kg)	2610650
Residential Total Exposure Duration - child + adult (yr)	26
Residential Exposure Duration - adult (yr)	20
Residential Exposure Duration - child (yr)	6
Residential Exposure Frequency (days/yr)	350
Residential Exposure Frequency - adult (days/yr)	350
Residential Exposure Frequency - child (days/yr)	350
Residential Air Inhalation Exposure Time (hrs/day)	24
Residential Exposure Time - adult (hrs/day)	24
Residential Exposure Time - child (hrs/day)	24
Residential Groundwater Exposure Time -adult (hr/event)	0.71
Residential Groundwater Exposure Time -age adjusted (hr/event)	0.6708
Residential Groundwater Exposure Time - child (hr/event)	0.54
Residential Groundwater Inhalation Exposure Time (hrs/day)	24
Residential Soil Exposure Time (hrs/day)	24
Residential Groundwater Events (event/day)	1

Program: Voluntary Remediation Program (VRP)Risk Based Performance Criteria

Default Hazard Index	Default Risk for Each Chemical	Default Risk for All Chemicals
1.00E+00	1.00E-05	1.00E-04
Residential Mutagenic Drinking Groundwater Ingestion Rate - age adjusted (L/kg)		1019.9
Residential Mutagenic Soil Ingestion Rate - age adjusted (mg-yr/kg-day)		166833.33
Residential Drinking Groundwater Ingestion Rate - age adjusted (L/kg)		327.95
Residential Soil Ingestion Rate - age adjusted (mg-yr/kg-day)		36750
Residential Air Inhalation Exposure Duration Mutagen Calculated - age adjusted (hr)		604800
Residential Groundwater Inhalation Exposure Duration Mutagen Calculated - age adjusted (d		25200
Residential Soil Inhalation Exposure Duration Mutagen Calculated - age adjusted (days)		25200
Residential Food Eggs Ingestion Rate (mg/day)		150000
Residential Food Fish/Shellfish Ingestion Rate (mg/day)		54000
Residential Food Fruit/Vegetables Ingestion Rate (mg/day)		122000
Residential Food Meat/Dairy (mg/day)		280000
Residential Soil Ingestion Rate - adult (mg/day)		100
Residential Soil Ingestion Rate - child (mg/day)		200
Residential Drinking Groundwater Ingestion Rate - adult (L/day)		2.5
Residential Drinking Groundwater Ingestion Rate - child (L/day)		0.78
LifeTime Residential/Industrial/Construction/Recreator/Trespasser (yrs)		70
Residential Soil Surface Area - adult (cm2/day)		6032
Residential Soil Surface Area -child (cm2/day)		2373
Residential Water Surface Area - adult (cm2/day)		19652
Residential Water Surface Area -child (cm2/day)		6365